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*Text Book of Geology* : By SIR ARCHIBALD GEIKIE, F.R.S. Third edition, revised and enlarged. Pp. i-xvi, 1147.

The preface to the third edition of this standard text-book states that it has been entirely revised and in some portions recast and re-written, so as to bring it abreast of the continuous advance of geological science.

A careful comparison of the third edition with the second indicates that this claim is fully warranted. The general plan of the volume is unchanged, but there are few discussions in which modifications do not appear. In many places the changes consist of nothing more than the addition or modification of a sentence or a paragraph. Even these minor modifications and additions are of great value, since in them are embodied many of the newer facts and ideas which recent research has developed. Thus we find the newer estimates of the average elevation of the continents ; new suggestions concerning the age of the earth ; the introduction of new descriptions of minerals of petrographical importance, and the modification of some upon which new light has been thrown by recent investigations ; the adoption of Rosenbusch's terms for certain rock structures ; the use of the word megascopic in place of macroscopic ; a re-arrangement of rocks upon a genetic basis, as sedimentary, massive or eruptive, and schistose or metamorphic, and a better subdivision under these heads ; throughout the descriptions of rocks, additions and improvements incorporating the more essential facts brought out in recent publications. The possibility of the metamorphic origin of some granites is minimized, and the probability that the greater number of them are eruptive is emphasized ; the processes of metamorphism are elaborated, and the kinds of mineralization of common occurrence are pointed out. We find, too, new facts as to the amplitude of earthquake waves ; the results of the more recent mathematical calculations concerning the distortions of the sea level by the attractive influence of land elevations ; fuller statements as to the possibility of changes of sea level, and concerning the causes of oscillations of the level of land and sea ; the conclusions to which experiment has led concerning the effect of hot water on the fusion temperature of rock ; new ideas concerning the flow of rock as the result of crushing and pressure ; clear cut statements growing out of recent discussions concerning the efficiency of glacial erosion ; a multitude of facts at one point and another drawn from the reports of the Challenger, and from the reports of other deep

sea exploring expeditions, as to sedimentation far out from land ; the results of recent biological investigation touching the supply of lime carbonate and silica from which animals and plants secure materials for their shells ; a more explicit statement than the earlier edition contained concerning the complexity of the glacial period ; a modification of the classification of geological formations of North America, incorporating the ideas of the correlation essays of the United States Geological Survey, etc., etc. The additions and changes concerning these topics fairly represent the character of the alterations to be found throughout the volume. These new touches are sufficiently numerous and suggestive to make the volume valuable, even to those already in possession of the earlier edition.

At a number of points the changes have been much more considerable. Thus twelve pages were devoted to the discussion of the Archæan in the old edition, while thirty-seven pages are given to the pre-Cambrian in the new. The general character of the changes at this point were foreshadowed in an article by Sir Archibald in the first number of this journal. Two groups of pre-Cambrian rocks are distinctly recognized, the lower consisting of gneisses and schists, and the other of the pre-Cambrian sedimentaries and volcanics. The character, the relations, and the genesis of these groups is briefly but comprehensively set forth. Concerning the first group the conclusion reached, as expressed in the author's own words, is as follows :

"These rocks are in the main various forms of original eruptive material, ranging from highly acid to highly basic ; they form in general a complex mass belonging to successive periods of extrusion ; some of their coarse structures are probably due to a process of segregation in still fluid or mobile, probably molten, material consolidating below the surface ; their granulitized and schistose characters, and their folded and crumpled structures point to subsequent intense crushing and deformation ; their apparent alternation with limestone and other rocks, which are probably of sedimentary origin, are deceptive, indicating no real continuity of formation, but pointing to the intrusive nature of the gneiss."

Concerning the second group of pre-Cambrian rocks, the sedimentary and volcanic series, Sir. Archibald takes the same position as in the article already referred to<sup>1</sup> and essentially the same position as that of Prof. Van Hise, already set forth in this journal<sup>2</sup> and elsewhere.<sup>3</sup>

<sup>1</sup> This Journal, Vol. I., p. 1.

<sup>2</sup> Vol. I., No. 2, p. 123.

<sup>3</sup> Bulletin 86, United States Geological Survey.

The adoption of any general terminology for the pre-Cambrian rocks is deprecated. In the author's judgment, "the term Laurentian cannot henceforth have more than a local significance." He further indicates his belief that "there will be much less impediment to the progress of investigation by the multiplication of local names than by the attempt to force indentifications for which there is no satisfactory basis. Each country will have its own terminology for pre-Cambrian formations, until some way is discovered of correlating these formations in different parts of the globe." The great duration of the time interval represented by the pre-Cambrian sedimentaries and their great unconformities is distinctly recognized. Much fuller details are given in this than in any earlier edition, concerning the development of the pre-Cambrian in different parts of the world. On the whole, the chapter on pre-Cambrian is much more satisfactory than in any other existing text-book. Several other periods are much more fully dealt with in this edition. This is especially true of the Silurian and Tertiary. Various new figures of fossils are introduced, representing important species of recent discovery.

In the section dealing with glacial geology, we notice that no distinction is made between the formations known in America as kames and osars, and are a little surprised to find the statement concerning kames (osars as we know them in America) that "no very satisfactory statement of their mode of origin has yet been given." Perhaps this may be true in a restricted sense, since there is much discussion as to the exact character of the streams which produce them, but that the formations which we have come to call osars were produced chiefly by superglacial or subglacial streams, does not seem to admit of serious question, so far as America is concerned. We are also surprised to find the loess placed in the recent or post-glacial series. This is not the correct reference of most of the loess in the United States, for at various points along the northern border of the very extensive loess covered area, as in Illinois and Iowa, the loess is frequently found beneath the till of the later ice invasions. The eolian theory of the origin of the loess is favored. This seems to be by far the most satisfactory theory for the Asiatic loess, and is finding much favor in connection with the loess of Europe. It is doubtless the loess of these countries to which reference is especially made. But the points urged in support of the eolian theory are not all applicable to the American formation. For example, "the thoroughly oxidized condition" of the iron content of the loess

cannot be urged in support of its eolian origin on this side of the Atlantic. Where the loess of the United States is typically developed, and has any considerable thickness, its iron content is not often thoroughly oxidized below a depth of four to six feet. The same is true of the loess of some parts of Germany. So, too, it may be much more troublesome to account for the presence of even a few aquatic shells in an eolian deposit, than for the presence of many land shells in a water deposit. The frequent inter-stratification of loess and sand at the base of the formation, the occasional presence in the loess of stone quite beyond the power of wind to transport, its general habit of following river courses, the presence of aquatic shells, and its lack of oxidation and leeching except for a short distance from the surface, are considerations of sufficient weight to make it very doubtful if the larger part of the American loess can be due to the wind. On the other hand, we believe that some (quantitatively a small part) of the loess of the United States is unquestionably of eolian origin. It has long seemed possible to the writer that formations may have been grouped together under this name which have had very different origins at very different times. This notion is emphasized in the volume before us, where the adobe of the United States, two or three thousand feet thick, is referred to as the loess, though this is not the formation commonly known as loess, and can hardly be one with it in origin. Many new facts are given concerning glaciation in regions where the work of the ice has not, until recently, been known.

The incorporation of the great body of new facts and suggestions throughout the volume has meant the digestion of a large body of recent literature. Indeed, there appears to have been very little geological literature produced since the earlier edition of the work of which the author has not made use, and to which we do not find explicit reference in the new edition.

ROLLIN D. SALISBURY.

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*Bodengestaltende Wirkungen der Eiszeit. Vortrag von* DR. AUG. BÖHM,  
*Privatdocent an der k. k. technischen Hochschule, Vienna.*

The difficulty of finding satisfactory summaries of the physical features of European countries makes such essays as the above especially welcome to the American student, particularly if he contemplates a trip abroad. The essay is one of a series of lectures, published by